



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/645,975	08/22/2003	Aaron Frank	TI-33974	8382
23494	7590	06/27/2006	EXAMINER	
TEXAS INSTRUMENTS INCORPORATED			LEADER, WILLIAM T	
P O BOX 655474, M/S 3999			ART UNIT	
DALLAS, TX 75265			PAPER NUMBER	
			1742	
DATE MAILED: 06/27/2006				

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/645,975

Applicant(s)

FRANK ET AL.

Examiner

William T. Leader

Art Unit

1742

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 30 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) 11,12 and 17-21 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-10 and 13-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_.

### DETAILED ACTION

1. Receipt of the papers filed on March 30, 2006, is acknowledged. Applicant has elected species 1 with claims 8, 9, 10, 14 and 15 readable thereon and with claims 1-7 and 13 being generic. Claims 11, 12 and 17-21 are withdrawn from consideration.

#### *Claim Rejections - 35 USC § 102*

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1-5, 7-10 and 13-16 are rejected under 35 U.S.C. 102(e) as being anticipated by Wen et al (2004/0118697).

3. The Wen et al patent is directed to a metal deposition process with pre-cleaning before electrochemical deposition. Wen et al teach that it is desirable to pre-clean a metal seed layer on a substrate prior to the formation of an electrochemically deposited metal fill layer. See the abstract. A system for carrying out the process is illustrated in figure 4. The system includes housing 403, an electrochemical deposition station 407, a pre-cleaning station which functions as a remediation module, and a substrate transfer mechanism represented by arrow 409. See the description of the apparatus in paragraph [0043]. Each element recited in instant claim 1 is disclosed by Wen et al. Wen et al teach that the pre-cleaning allows electroplating solution to evenly coat the workpiece surface (paragraph 0045), indicating the presence of an electrolyte bath in the electrochemical deposition station as recited in instant claim 2 and 3. The substrate transfer mechanism may be a robotic arm (paragraph 0043) as recited in instant claims 4 and 5.

The pre-clean remediation station may include a reactive plasma system adapted to form a hydrogen or an oxygen plasma as recited in instant claims 7-10 and 14-16. See paragraphs [0054] to [0058] and figure 5. Wen et al discloses that the electrochemically deposited metal fill layer may be copper as recited in instant claim 13. See paragraph [0045].

4. Claims 1-4, 6, 7 and 13 are rejected under 35 U.S.C. 102(e) as being anticipated by Yoshioka et al (2005/0082163).

5. The Yoshioka et al patent is directed to a plating apparatus suitable for forming a plated film in trenches for interconnects on a semiconductor wafer. See the abstract. A plan view of the apparatus is shown in figure 3b. The apparatus includes a plurality of processing stations within a single housing. The processing stations include pre-soaking tank 28 for etching the surface of a seed layer formed on the surface of the substrate in order to remove the oxidized layer having high electrical resistance. Cleaning tanks 30a and 30b which contain pure water for cleaning the surface of the substrate are provided next. Immediately following is copper electroplating tank 34. The substrate is moved by robotic arms 22 and 42. See paragraphs [0090], [0143] and [0144]. All elements recited in instant claims 1-4, 6, 8 and 13 are present in the apparatus of Yoshioka et al.

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wen et al in view of Yoshioka et al.

9. Wen et al and Yoshioka et al are interpreted and applied as above. Claim 6 differs from the apparatus disclosed by Wen et al by reciting that the substrate transfer system comprises multiple device instances. Wen et al only schematically a single arrow representing a transfer mechanism. Yoshioka et al shows that more than one transfer device may be used to move substrates between a plurality of processing stations in an integrated processing apparatus. The prior art of record is indicative of the level of skill of one of ordinary skill in the art. It would have been obvious to have provided more than one transfer device as shown by Yoshioka et al in the apparatus of Wen et al because improved movement of the substrates would have been facilitated.

10. Claims 5, 8, 9, 14 and 15 rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka et al in view of Liu et al (6,395,642).

11. Yoshioka et al is taken as above. Claims 8 and 14 recite a reactive plasma system, while claims 9 and 15 recite that the system comprises hydrogen plasma. As noted above, Yoshioka et al discloses a pre-clean station 28 for removing the oxide on the seed layer but does not disclose that the pre-clean station may utilize a plasma. The Liu et al patent is directed to filling trenches on a semiconductor wafer with electroplated copper. Liu et al recognize that the oxidation of the seed layer is problematic. The problem may be overcome by plasma cleaning utilizing a hydrogen-containing plasma either in-situ or ex-situ in combination with the step of electrochemical copper deposition (column 6, lines 21-31). It would have been obvious to have utilized plasma cleaning as taught by Liu et al in place of the cleaning of Yoshioka et al because it is effective in cleaning a copper seed layer and reducing copper oxide on the seed layer. Instant claim 5 recites only a single transfer device while Yoshioka et al shows the use of more than one transfer device. The elimination of a transfer device from Yoshioka et al along with its function would have been obvious.

12. Claim 10 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshioka et al in view of Liu et al as applied to claims 5, 8, 9, 14 and 15 above, and further in view of You.

13. The You patent is directed to a method for fabricating a transistor. You teaches that oxide materials may be effectively removed in an oxygen-containing plasma. See column 6, lines


Art Unit: 1742

9-11. It would have been obvious to have utilized an oxygen-containing plasma to remove oxides from the seed layer as suggested by Yoshioka et al in view of Liu et al because an oxygen-containing plasma is capable of performing this function as shown by You.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to William T. Leader whose telephone number is 571-272-1245. The examiner can normally be reached on Mondays-Thursdays and alternate Fridays, 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Roy King, can be reached on 571-272-1244. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
William Leader  
June 21, 2006

  
ROY KING  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700